Estd. 1962
"A++" Accredited by NAAC (2021)
With CGPA 3.52

SHIVAJI UNIVERSITY, KOLHAPUR
416 004, MAHARASHTRA
PHONE : EPABX – 2609000, BOS Section – 0231-2609094, 2609487
Web : www.unishivaji.ac.in Email: bos@unishivaji.ac.in
शिवाजी विद्यापीठ, कोल्हापूर ४१६ ००४, महाराष्ट्र
दूरध्वनी - इपीबीएक्स - २०६०९०००, अभ्यासमंडळे विभाग : ०२३१- २६०९०९४, २६०९४८७
वेबसाईट : www.unishivaji.ac.in ईमेल : bos@unishivaji.ac.in

SU/BOS/Sci & Tech/ 499 **Date: 18 /08/2025**

To,

The Principal,
All Concerned Affiliated Colleges/Institutions
Shivaji University, Kolhapur

The Head/ Director/ Co-ordinator
All Concerned Department (Science)
Shivaji University, Kolhapur

Subject: Regarding revised syllabi of B.Sc. Part-II (Sem.III & IV) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0)

Ref: No. SU/BOS/Science/271 & 274 Date: 03/05/2025 Letter.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the syllabi, nature of question paper of B.Sc. Part-II (Sem.III & IV) degree programme under the Faculty of Science and Technology as per NEP-2020 (2.0).

B.Sc. Part-II (Sem. III & IV) as per NEP-2020 (2.0)			
1.	B.Sc.Part II Biochemistry	5.	Computer Science (Entire)
2.	Animation (Entire)	6.	Computer Science (Optional)
3.	B.Sc. - M.Sc. AI&ML)	7.	Information Technology (Entire)
4.	BCA		

This syllabus, nature of question and equivalence shall be implemented from the academic year 2025-2026 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk (Online Syllabus)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2025 & March/April 2026. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Dr. S. M. Kubal
Dy. Registrar

Encl. : As above.

Copy to: For Information and necessary action.

1	I/c Dean, Faculty of Science & Technology	7	Appointment Section A & B
2	Director, Board of Examinations & Evaluation	8	Affiliation Section (T.1) (T.2)
3	The Chairpersan, Respective Board of Studies	9	P.G.Admission Section,
4	B.Sc. Exam Section	10	Computer Centre / IT Cell
5	Eligibility Section	11	Internal Quality Assorance Cell (IQAC)
6	P.G Seminar Section		

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शिवाजी विद्यापीठ, कोल्हापूर -४१६००४,महाराष्ट्र
दूरध्वनी-ईपीएबीएक्स -२६०९०००, अभ्यासमंडळे विभाग दुरध्वनी ०२३१—२६०९०९४
०२३१—२६०९४८७

Ref.No.SU/BOS/Science/271 **Date: 03/05/2025**

To,

The Principal,
All Concerned Affiliated Colleges/Institutions
Shivaji University, Kolhapur.

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B.Sc.Part-II (Sem. III & IV) as per NEP-2020 (2.0)			
1.	Pollution	8.	Food Science (Entire)
2.	Biochemistry	9.	Biotechnology (Entire)
3.	Food Science and Quality Control	10.	Environmental Science (Entire)
4.	Computer Science (Optional)	11.	Information Technology (Entire)
5.	Biotechnology (Optional/Vocational)	12.	Food Science and Technology (Entire)
6.	Animation (Entire)	13.	Food Technology & Management (Entire)
7.	Computer Science (Entire)	14.	All Faculty UG Part II Environmental Studies (VEC)

This syllabus, nature of question and equivalence shall be implemented from the academic year 2025-2026 onwards. A soft copy containing the syllabus is attached herewith and it is also available on university website www.unishivaji.ac.in NEP-2020@suk(Online Syllabus)

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October /November 2025 & March/April 2026. These chances are available for repeater students, if any.

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Dy Registrar
Dr. S. M. Kubal

Encl: As above

for Information and necessary action

Copy to:

1	Dean, Faculty of Science & Technology	6	Appointment Section A & B
2	Director, Board of Examinations and Evaluation	7	I.T.Cell /Computer Centre
3	Chairman, Respective Board of Studies	8	Eligibility Section
4	B.Sc.-M.Sc. Exam Section	9	Affiliation Section (T.1) (T.2)
5	Internal Quality Assurance Cell (IQAC Cell)	10	P.G. Seminar Section

SHIVAJI UNIVERSITY, KOLHAPUR

NAAC A++ Grade with CGPA 3.52

Multiple Entry and Multiple Exit Option (NEP-2020)

Syllabus for

B.Sc. Information Technology (Entire)

(Under Faculty of Science and Technology)

With Major as Information Technology

PART-II SEMESTER-III & IV

(Syllabus to be implemented from Academic Year 2025-26)

B.Sc. Information Technology Entire Part II (Level-5.0)

Multiple Entry and Multiple Exit Option (NEP-2020)

B.Sc. Information Technology (Entire Part – II) (Level-5.0)

With Information Technology as Major

SEMESTER-III (Duration-Six Month)										
Sr. No.	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment(UA)			Internal Assessment(IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
1	**Subject I Major III:** Object Oriented Programming	2	-	2	30	11	1	20	07	1
2	**Subject I Major IV**: DBMS & RDBMS	2	-	2	30	11	1	20	07	1
3	**Subject I Practical III**: Practical Based on Subject I Major III & Major IV	-	4*	2	40	14	-	10	04	-
4	**Minor V:** As per students choice and availability but must be continued with Minor I and Minor IV	2	-	2	40	14	2	10	04	2
5	**Minor VI :** As per students choice and availability but must be continued with Minor I and Minor IV	2	-	2	40	14	2	10	04	2
6	**Minor Practical III:** Practical based on Minor V and Minor VI	-	4*	2	40	14	-	10	04	-
7	**OE – III (T/P)**: As per students choice and can be opted from other than BSc. (ie. B.Com or BA) Basket	2	2	2	40	14	2	10	04	2

8	**VSC – I (P)Major specific:** Java Scripting	-	4*	2	40	14	2	10	04	2
9	**SEC-I (P):**Python Programming	-	4*	2	40	14	2	10	04	-
10	**AEC-I:** Formal Communication	2	-	2	40	14	2	10	04	2
11	**CC-I:**NSS	2	-	2	40	14	2	10	04	2
	Total (A)			**22**	**440**			**110**		

SEMESTER-IV(Duration- Six Month)

Sr. No.	**Course Code**	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment(UA)			Internal Assessment(IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
1	**Subject I Major V:**Data Structure using C++	2	-	2	40	14	2	10	04	2
2	**Subject I Major VI**: System analysis design & UML	2	-	2	40	14	2	10	04	2
3	**Subject I Practical III:** Practical Based on Subject I Major V & Major VI	-	4*	2	40	14	2	10	04	-
4	**Subject II Minor V**: As per students choice and availability but must be continued with Minor I and Minor III	2	2	2	40	14	2	10	04	2
5	**Subject II Minor VI:** As per students choice and availability but must be continued with Minor II and Minor IV	2	2	2	40	14	2	10	04	2
6	**Subject II Practical III:** Practical Based on Subject Minor VII and VIII	-	4*	2	40	14	2	10	04	-
7	**OE – III (T/P) :** As per students	2	2	2	40	14	2	10	04	2

	choice and can be opted from other than BSc. (ie. B.Com or BA) Basket									
8	**SEC-II (P):**Advanced Python Programming	-	4*	2	40	14	2	10	04	-
9	AEC-II Soft skills	2	-	2	40	14	2	10	04	2
10	**VEC – II (T)** Environment Studies	2	-	2	40	14	2	10	04	2
11	CEP-I (P): Field Work	-	4	--	10	4	--	40	14	90
	Total (A)			**22**	**440**			**110**		

*: 4 Practical hours per batch with batch size 30 students

• **OE:** Open Elective	• **SEC:** Skill Enhancement Course
• **VSC:** Vocational Skill Course	• **AEC:** Ability Enhancement Course
• **CC:** Co-Curricular Course	• **CEP:** Community Engagement Program

Multiple Entry and Multiple Exit Option (NEP-2020)

B.Sc. Information Technology (Entire Part - II (Level-5.0)

With Electronics as Minor

SEMESTER-III(Duration-Six Month)										
Sr. No.	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment (UA)			Internal Assessment(IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
1	**Subject II Minor V** :Computer Organization	2	-	2	40	14	2	10	04	2
2	**Subject II Minor VI:** Electronic Communication	2	-	2	40	14	2	10	04	2
3	**Subject II Practical III:** Practical Based on Subject Minor VI	-	4*	2	40	14	-	10	04	-

SEMESTER-IV(Duration- Six Month)										
Sr. No.	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment(UA)			Internal Assessment(IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
1	**Subject II Minor V**: Computer Networking	2	2	2	40	14	2	10	04	2
2	**Subject II Minor VI:** Micro-Controller & Interfacing	2	2	2	40	14	2	10	04	2
3	**Subject II Practical III:** Practical Based on Subject Minor VI	-	4*	2	40	14	2	10	04	-

Multiple Entry and Multiple Exit Option (NEP-2020)
B.Sc. Information Technology (Entire Part - II (Level-5.0)

With Electronics as Minor

SEMESTER-III(Duration-Six Month)										
Sr. No.	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment (UA)			Internal Assessment(IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
1	**Subject II Minor V** : Linear Algebra	2	-	2	40	14	2	10	04	2
2	**Subject II Minor VI:** Linear Programming and Game Theory	2	-	2	40	14	2	10	04	2
3	**Subject II Practical III:** Practical Based on Subject Minor VI	-	4*	2	40	14	-	10	04	-

SEMESTER-IV(Duration- Six Month)										
Sr. No.	Course Code	Teaching Scheme			Examination Scheme					
		Theory and Practical			University Assessment(UA)			Internal Assessment(IA)		
		Lectures (Per week)	Hours (Per week)	Credit	Maximum Marks	Minimum Marks	Exam. Hours	Maximum Marks	Minimum Marks	Exam. Hours
1	**Subject II Minor V**: Computational Geometry	2	2	2	40	14	2	10	04	2
2	**Subject II Minor VI:** Optimization Techniques	2	2	2	40	14	2	10	04	2
3	**Subject II Practical III:** Practical Based on Subject Minor VI	-	4*	2	40	14	2	10	04	-

B.Sc. Information Technology (Semester – III) (NEP 2.0) (Level – 5.0)
Course: Subject I Major III
Course Title: Object Oriented Programming (Major)
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Teaching Scheme: Theory - 02 Lectures / Week Marks: 50 Credits: 02

Course Outcomes:

After completion of this course students will be able to;

1. Understand basic concepts of object oriented programming.
2. Use various control structures to improve programming logic.
3. Use constructor and destructor.

Unit I: (15 Hours)

Difference between POP and OOP. Concepts of OOP- Data abstraction, Encapsulation, Inheritance, Polymorphism. Basics data types. Operators in C++: DMA operators (new, delete), scope resolution operator, type cast operators (const_cast, static_cast, dynamic_cast, reinterpret cast), manipulators (setw, endl, setprecision) .Structure of C++ program. Input and output streams .Dynamic Memory allocation (New and Delete), this pointer. Dynamic initialization of variable, reference variables. Features of OOP: Classes and Objects-Definitions, class declaration. Member function- Access modifiers: private, public and protected, defining member functions, static data members. Array of objects, passing object parameter, inline function, reference arguments. Friend function and friend class.

UNIT II (15 Hours)

Constructors- Definition, types- Default constructor, Copy constructor, Parameterized constructor. Destructors. Operator overloading -Definition overloading unary and binary operators. Overloading operators using friend function. Rules for overloading operator.

Inheritance-Defining base and derived class. Types of Inheritance–Single, multiple, multilevel, hierarchical, hybrid. Polymorphism-Definition, Types of polymorphism. Virtual function.

Reference Books:

1. Object oriented programming By E. Balagurusamy

2. C++ Programming–By D. Ravichandran

3. Let Us C++By YashawantKanetkar

4. Object Oriented Programming in C++-Dr. G.T. Thampi, Dr. S. S. Mantha

B.Sc. Information Technology (Semester – III) (NEP 2.0) (Level – 5.0)
Course: Subject I Major IV
Course Title: DBMS & RDBMS (Major)
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Teaching Scheme: Theory - 02 Lectures / Week Marks: 50 Credits: 02

Course Outcomes:

After completion of this course students will be able to;

1. Gain knowledge of fundamentals of DBMS, database design andnormal forms.
2. Be acquainted with the basics of transaction processing and concurrency control
3. Familiarity with database storage structures and access techniques

UNIT I (15 Hours)

Characteristics of database approach, Data models: Hierarchical, Network, Relational, Schema and Instances, DBMS architecture: Three Schema Architecture: Internal, Conceptual & External, Data independence: Logical, Physical. Relational constraint: not null, unique, primary, foreign, check. Relational algebra: Select, Project, Union, Intersection, Difference.SQL queries: DDL: create, alter, and drop. DML: insert, update, delete. SQL: select. SQL operator: Logical, Arithmetic, relational, in, between, like, not, is null.SQL Clauses & Aggregate Functions: SUM, MAX, MIN, COUNT, and AVG.

UNIT II (15 Hours)

Introduction to PL /SQL: Introduction, Difference between SQL AND PL/SQL, Block definition structure and Data types, Block Functions - %Type, %Row Type, Control statements, Looping statements and sequential statement, Exception-handling. Simple PL/SQL blocks. Cursor management: meaning, types and importance, implicit and explicit cursor management using simple example. Trigger: meaning importance and types of triggers, examples using trigger Procedures-Definition, creating procedures, passing parameters. Function -Definition, syntax and calling methods, passing parameters.

Reference Books:

1. Database Systems design, Implementation, and Management, Peter Rob & Carlos Coronel 7th Edition
2. Fundamentals of Database Systems, ElmasriNavrate, Pearson Education
3. Introduction to Database Systems, C. J. Date, Pearson Education
4. Oracle for Professionals, The X Team, S.Shah and V. Shah, SPD.
5. Database Systems Using Oracle: A Simplified guide to SQL and PL/SQL,Shah, PHI.

B.Sc. Information Technology (Semester – III) (NEP 2.0) (Level – 5.0)
Course: Practical III (Major)
Course Title: Practical Based on Subject I Major III & Major IV
Teaching Scheme: Practical - 04 Lectures / Week

Course Outcomes:

After completion of this course students will be able to;

1. Develop applications with class
2. Develop applications with overloading
3. Develop applications with inheritance

1 Function Default Argument:

i) To calculate perimeter of square (4*r), rectangle (2*l+2*b), triangle (a+b+c)

ii) To calculate area of square(r*r), rectangle (l*b), trapezium (1/2*h*(s1+s2)) Keeping other argument to default value zero.

2 Function Overloading:

i) To calculate perimeter of square (4*r), rectangle (2*l+2*b), triangle (a+b+c)

ii) To calculate area of square(r*r), rectangle(l*b), trapezium (1/2*h*(s1+s2))

3 Constructor and Destructor: Demonstrate working of constructor (default, parameterized, copy) and destructor to allocate and de-allocate memory to or from an array of integers using DMA operators new and delete.

4 Static Members: Display counter which counts numbers of objects of class, counter is incremented in constructor and decremented in destructor.

5 Friend Function: Create two classes Celsius and Fahrenheit and define friend functions to add and to compare two temperatures.

6 Operator Overloading: To overload addition, multiplication, unary minus operator on class Integer

7 Operator Overloading: To overload Type Cast operator to convert temperature in Degree Celsius to Degree Fahrenheit and Degree Fahrenheit to Degree Celsius using classes Celsius and Fahrenheit. F=9/5*c+32

8 Pure Virtual Function And Inheritance: To specify base class Shape with pure virtual methods Input(), Perimeter() and Area(). Inherit three classes Square, Rectangle and Triangle from class Shape with appropriate data members and override methods Input(), Perimeter() and Area(). Use Pointer of class Shape to access objects of three classes and demonstrate working in “main” function.

DBMS & RDBMS Lab:

DDL Commands

1. Create tables with relevant foreign key constraints

2. Populate the tables with data

3. Perform the following queries on the database:

a) Display all the details of all employees working in the company.
b) Display ssn, lname, fname, address of employees who work in department no 7.
c) Retrieve the birthdate and address of the employee whose name is 'Franklin T.
d) Wong'
e) Retrieve the name and salary of every employee
f) Retrieve all distinct salary values
g) Retrieve all employee names whose address is in ‘Bellaire’
h) Retrieve all employees who were born during the 1950s
i) Retrieve all employees in department 5 whose salary is between 50,000 and
j) 60,000(inclusive)
k) Retrieve the names of all employees who do not have supervisors
l) Retrieve SSN and department name for all employees
m) Retrieve the name and address of all employees who work for the 'Research' department
n) For every project located in 'Stafford', list the project number, the controlling department number, and the department manager's last name, address, and birthdate.
o) For each employee, retrieve the employee's name, and the name of his or her immediate supervisor.
p) Retrieve all combinations of Employee Name and Department Name
q) Make a list of all project numbers for projects that involve an employee whose last name
r) is 'Narayan’ either as a worker or as a manager of the department that controls the project.

B.Sc. Information Technology (Entire) (Part-II)(Semester-III)(NEP2.0)(Level–5.0)

Course III, Minor V Course Title: Computer Organization (Minor)

Total Contact Hours: 30 hrs. (30 lectures of 60 min.)

Credits: 02 Teaching Scheme: Theory–2Lectures/Week Total Marks: 40

Course Outcomes (COs): On completion of the course, the students will be able to

1. Understand the designing of Combinational circuits & Sequential circuits,
2. Understand the Internal organization of Memory,
3. TostudyandunderstandtheInput&Outputdevicesorganizationinacomputer,
4. To study the architecture CPU & internal organization of CPU,

Units	Contents	Hours
1.	**A) Digital System Design:** **Combinational circuits design**: Design of Full Adder, Full Subtractor, Design of Binary to Gray code converter, Gray to Binary code converter, Design of 1-bit & 2-bit Digital Comparator or (i.e. Magnitude Comparator), **Sequential circuit design:** Excitation tables of different Flip-flops, Design of 2-bit Synchronous Up counter or Down counter by using JK flip-flops or T-flip-flops, Design of 3-bit Non-sequential Counter (i.e. Random sequence Counter), **B) Memory Organization:** Classification &Characteristics of memory systems, Internal organization of RAM memory& ROM memory, Memory maps, **Memory Expansion**: Horizontal memory expansion with example, Vertical memory expansion with example, Memory interfacing diagrams with CPU, Cache memory, Cache memory mapping techniques, Virtual memory &Swapping process,Pagingtechnique&Segmentationtechnique,ComparisonbetweenPaging & Segmentation,	**15**

2.	**A) Input/Output Organization:** I/O devices, System bus, I/O bus, Addressing methods: I/O mapped I/O Isolated I/O) & Memory mapped I/O, Comparison between I/O mapped I/O & Memory mapped I/O, **I/O interfaces:** Internal block diagram of Parallel I/O interface, Internal block diagram of Serial I/O Interface (i.e. **UART**),Internal block diagram of **DMA controller,** DMA I/O data transfer with the interfacing diagram of DMA controller with the CPU**,** IOP processor, Interfacing diagram between IOP processor & Master CPU **B) CPU Organization:** Functions of CPU, Internal block diagram of CPU, Control unit: Introduction of Hard wired control unit & Micro-programmed control unit, **RISC & CISC** Architecture CPU, Comparison between RISC & CISC CPU, Pipelining technique inside the CPU, Combinational ALU, Sequential ALU, Internal Organization of CPU: Accumulator based CPU, Register based CPU, Stack based CPU,	**15**

Reference Books:

1. Computer Organization, by J. P. Hays,
2. Digital System Design, by Techmax/ Nirali publication,
3. Computer System Architecture by Morris Mano,

B.Sc. Information Technology (Entire)(Part-II)(Semester-III)(NEP)

Course III Minor VI Course Title: Electronic Communication (Minor)

Total Contact Hours: 30 hrs. (30 lectures of 60 min.)

Credits: 02 Teaching Scheme: Theory–2Lectures/Week

Course Outcomes (COs): On completion of the course, the students will be able to**:**

1. Understand the concept to Electronic communication,
2. Understand Different Modulation techniques,
3. Understand Different Multiplexing techniques,
4. Understand wireless telecommunication systems,

Unit	Contents	Hours
1	**A) Introduction to Electronic Communication Systems:** Block diagram of Electronic communication system, Electromagnetic spectrum, Types of Electronic communication, Applications of different Communication system, Noise signal , types of Noise signal, Signal to Noise ratio, Signal bandwidth, Channel bandwidth, Nyquist Sampling theorem, Shannon's theorem for channel capacity, **B) Analog Modulation:** Need of modulation, classification of modulation techniques, Baseband signal, carrier signal, Modulation, demodulation, Analog modulation: **Amplitude modulation** & demodulation , Representation of AM signal in Time domain & Frequency domain, Modulation index, Equation of AM signal, Power distribution in AM signal, **Frequency Modulation** & Demodulation, Representation of FM signal in time domain & frequency domain, Modulation index, Comparison between AM & FM modulation,	**15**
2	**A) Digital Modulation & Multiplexing:** Classification of Pulse modulation: PAM, Pulse code modulation(PCM), Delta modulation, block diagrams & working of each, Digital modulation: ASK, FSK, PSK, Block diagram of FSK-MODEM, **Multiplexing:** Time division multiplexing, frequency division multiplexing, Code division multiplexing, **B) Wireless Communication:**	**15**

	Introduction to mobile communication, Cellular concept, Working of GPS, Handover mechanism in mobile communication, Introduction to GPRS, **Wireless Protocols:** RFID, ZigBee, BlueTooth & WiFi protocols, Comparison between these wireless protocols,	

Reference Books:

1. Electronic Communication by Roddy Coolen,
2. Electronic Communication by Robert Kennedy,
3. Communication Electronics by L.E .Frenzel

B.Sc. Information Technology (Entire)(Part-II)
(Semester-III)(NEP) Minor Practical- III (Minor)
Electronics Practical based on Computer Organization and Electronic Communication
Credits:02 Teaching Scheme: Practical–4 Lectures/Week/batch
Total Marks:50

Sr. No.	Name of the Practical
1	Study of Amplitude Modulation & Demodulation
2	Study of Frequency Modulation & Demodulation,
3	Study of ASK Modulator & Demodulation,
4	Study of FSK Modulation & Demodulation
5	Study of PAM modulation & Demodulation
6	Study of PWM modulation & Demodulation
7	Study of Pulse code Modulation & Demodulation
8	Study of BPSK modulation & demodulation
9	Study of 2 bit Synchronous Up & Down counter,
10	Study of 4 bit Asynchronous counter
11	Study of Binary to Gray & Gray to Binary code convertor
12	Study of 1 bit Digital Comparator
13	Study of Schmitt Trigger by using OPAMP
14	Study of Integrator & Differentiator, by using Op-Amp
15	Study of 3 bit flash ADC circuit
16	Study of LDR based light control system
17	Study of architecture of Motherboard of Computer
18	Study of Passive filters &Active filters using Op-Amp
19	Study of wave form generations using Op-Amp,
20	Study of Oscillators using Op-Amp,

B.Sc. Information Technology (Semester – III) (NEP 2.0) (Level – 5.0)
Course: Minor V
Course Title: Linear Algebra (Minor)
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Teaching Scheme: Theory - 02 Lectures / Week
Marks: 50 Credits: 02

Course Learning Outcomes:

This course will enable the students to:

1. Solve systems of linear equations using Gauss Elimination and Gauss-Jordan methods to find unique, infinite, or no solutions.
2. Compute eigenvalues and eigenvectors of a matrix and apply the Cayley-Hamilton theorem to verify and solve matrix equations.
3. Explain the concepts of vector spaces and subspaces, and distinguish between linear dependence and independence with examples.
4. Determine the bases and dimensions of vector spaces and subspaces to analyze their structure.

Unit 1: Linear Equations and Matrices: (15 Hrs.)

1.1 Matrices
1.2 Matrix Transformation
1.3 Linear Systems
1.4 Results on system of linear equations and invertible matrices(Statements Only)
1.5 Solutions of System of Linear Equations
1.5.1 Gauss Elimination Method
1.5.2 Gauss-Jordon Method
1.6 Eigen values and Eigen Vectors
1.7 Cayley-Hamiltonian theorem(Statement Only) and Examples

Unit 2: Vector Space and Inner Product Space (15 Hrs.)

2.1 Vector Space
2.2 Sub Space
2.3 Linear Dependent and Independent
2.4 Basis and Dimension
2.5 Definition and Examples of Inner Product Space
2.6 Properties of Inner Product Space
2.7 Orthonormal Basis in R
2.8 Gram-Schmidt Process

Recommended Book:

1. Elementary Linear Algebra with Applications, Howard Anton, Chris Rorres, John Wileyandsons., 7th Edition (1994).

Recommended Books:

1. A Textbook of Matrices, Shanti Narayan, P.K. Mittal, S. Chand Publishing, Revised Edition (2010).
2. Topics in Algebra, I.N. Herstein, John Wiley & Sons, 2nd Edition (1991).

Schaum's Outline of Linear Algebra, Seymour Lipschutz,

B.Sc. Information Technology (Semester – III) (NEP 2.0) (Level – 5.0)
Course: Minor VI
Course Title: Linear Programming and Game Theory (Minor)
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Teaching Scheme: Theory - 02 Lectures / Week Marks: 50 Credits: 02

Course Learning Outcomes:

This course will enable the students to:

1. Explain the fundamental concepts of operations research, including its characteristics, scope, and limitations.
2. Apply graphical and simplex methods, including Big-M and Two-Phase methods, to solve linear programming problems.
3. Analyze different game theory strategies such as saddle points, dominance methods, and graphical methods for two-player games.
4. Evaluate optimal solutions for linear programming and game theory problems using appropriate mathematical techniques.

Unit I: Linear Programming (15 Hrs)

1.1 Basics of operation research, Characteristics, scope, limitations of operation research
1.2 Introduction of Linear Programming Problems,
1.3 Graphical methods for Linear Programming problems.
1.4 General formulation of Linear Programming problems, Slack and surplus variables, Canonical form, Standard form of Linear Programming problems.
1.5 Simplex method and examples
1.6 Big-M-Method and Examples
1.7 Two Phase Method and Examples

Unit II: Game Theory 15Hrs

1.1 Basic definitions of Game theory
1.2 Saddle point and examples
2.3Algebraic method for 2×2 size game and examples
2.4 Arithmetic method for 2×2 size game and examples
2.5 Principal of dominance, Dominance method and examples
2.6 Subgame method
2.7 Graphical method for $2 \times n$ and $m \times 2$ size game and examples

Recommended Book:

1. Operations Research, S. D. Sharma, 15th Edition, KedarNath Ram Nath & Co., 2010.

Reference Books:

1. Principles of Operations Research, H. M. Wagner, 2nd Edition, Prentice Hall, 1975.
2. Operations Research, Gupta and Hira, S. Chand & Company, 2008.
3. Operations Research: Theory and Applications, J. K. Sharma, 2nd Edition, Macmillan Publishers, 2003.

B.Sc. Information Technology (Semester – III) (NEP 2.0) (Level – 5.0)
Course: Subject II Practical III
Course Title: Minor Practical III (Minor)
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Teaching Scheme: Theory - 04 Practical / Week Marks: 50 Credits: 02

Practical Number	Title of the practical
1	Linear dependence and Independence of vectors
2	Gram Schmidtprocess
3	Gauss Elimination Method
4	Gauss-Jordon Method
5	Eigen values and Eigen vectors
6	Verification of Cayley-Hamilton theorem
7	Inverse of a matrix using Cayley-Hamilton Theorem
8	Linear Programming Problems
9	Simplex Method
10	Big M Method
11	Two Phase Method
12	Game theory algebraic method and arithmetic method
13	Game theory subgame method
14	Principal of dominance, Dominance method
15	Graphical method for $2 \times n$ and $m \times 2$ size game

B.Sc. Information Technology (Semester – III) (NEP 2.0) (Level – 5.0)
Course: VSC – I (P) Major specific
Course Title: Java Scripting
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Teaching Scheme: Theory - 04 Practical / Week Marks: 50 Credits: 02

Course Outcomes:

After completion of this course students will be able to;

1. To design and implement dynamic web page with validation using JavaScript objects
2. To apply different event handling mechanisms.
3. To design front end web page and connect to the back end databases.

Lab Course:-

1. JavaScript Program To Print Hello World
2. JavaScript Program to Swap Two Variables
3. JavaScript Program to Solve Quadratic Equation
4. JavaScript Program to Check if a number is Positive, Negative, or Zero
5. JavaScript Program to Check if a Number is Odd or Even
6. JavaScript Program to Find the Factorial of a Number
7. JavaScript Program to Display the Multiplication Table
8. JavaScript Program to Find Armstrong Number in an Interval
9. JavaScript Program to Make a Simple Calculator
10. JavaScript Program to Find the Sum of Natural Numbers
11. JavaScript Program to Display Fibonacci Sequence Using Recursion
12. JavaScript Program to Check Whether a String is Palindrome or Not
13. JavaScript Program to Check if a Key Exists in an Object
14. JavaScript Program to Clone a JS Object
15. JavaScript Program to Loop Through an Object
16. JavaScript Program to Merge Property of Two Objects
17. JavaScript Program to Create Multiline Strings
18. JavaScript Program to Format Numbers as Currency Strings
19. JavaScript Program to Append an Object to an Array
20. JavaScript Program to Check if An Object is An Array
21. JavaScript Program to Include a JS file in Another JS file
22. JavaScript Program to Get File Extension
23. JavaScript Program to Illustrate Different Set Operations
24. Develop Angular JS program that allows user to input their first name and lastname and display their full name.
25. Develop an Angular JS application that displays a list of shopping items. Allow users to add and remove items from the list using directives and controllers.
26. Write an AngularJS application that can calculate factorial and compute square based on given user input.
27. Develop AngularJS application that displays details of students and their CGPA. allow users to read the number of students and display the count.

B.Sc. Information Technology (Semester – III) (NEP 2.0) (Level – 5.0)
Course: SEC-I
Course Title: Python Programming
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Teaching Scheme: Theory - 04 Practical / Week
Marks: 50 Credits: 02

Course Outcomes:

After completion of this course students will be able to;

1. Develop and execute simple Python programs.
2. Write simple Python programs using conditionals and loops for solving problems.
3. Decompose a Python program into functions.
4. Represent compound data using Python lists, tuples, dictionaries etc.
    a) Write a program to demonstrate different number data types in Python.
    b) Write a program to perform different Arithmetic Operations on numbers in Python.
    c) Write a program to create, concatenate and print a string and accessing sub-string from a given string.
    d) Write a program to create, append, and remove lists in python.
    e) Write a program to demonstrate working with tuples in python.
    f) Write a program to demonstrate working with dictionaries in python.
    g) Write a python program to find largest of three numbers.
    h) Write a Python program to convert temperatures to and from Celsius, Fahrenheit. [Formula: c/5 = f-32/9]
    i) Write a Python program to construct the stars(*) pattern, using a nested for loop
    j) Write a Python script that prints prime numbers less than 20.
    k) Write a python program to find factorial of a number using Recursion.
    l) Write a program that accepts the lengths of three sides of a triangle as inputs. The program output should indicate whether or not the triangle is a right triangle (Recall from the Pythagorean Theorem that in a right triangle, the square of one side equals the sum of the squares of the other two sides).
    m) Write a python program to define a module to find Fibonacci Numbers and import the module to another program.
    n) Write a python program to define a module and import a specific function in that module to another program.
    o) Write a script named copyfile.py. This script should prompt the user for the names of two text files. The contents of the first file should be input and written to the second file.

p) Write a program that inputs a text file. The program should print all of the unique words in the file in alphabetical order.
q) Write a Python class to convert an integer to a roman numeral.
r) Write a Python class to implement pow(x, n).
s) Write a Python class to reverse a string word by word.

B.Sc. Information Technology (Semester – III) (NEP 2.0) (Level – 5.0)

Course: AEC-I
Course Title: Formal Communication
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Marks: 50 Credits: 02

Course Outcomes:

The course will enable students to;

1. Introduce communication techniques

2. Have professional correspondence techniques

3. Enhance writing skills

UNIT I **(15 HOURS)**

Communication: Nature and Importance of Communication, Objectives of Communication, Importance of Communication, Process and barriers to Communication, Elements of Communication, Forms of Communication Verbal Communication Techniques: Art of Speaking, Speech Styles. Oral Presentation- Preparation of Formal Speech, Meetings, Interviews, Group Discussion, Debate, Elocution, Extempore.

UNIT II **(15 HOURS)**

Non-verbal Communication-Meaning, Characteristics & classification of Non-verbal Communication, Body Language, Gestures, Postures. Listening & observation skills. Rapid review of Grammar:- Corrections of common errors, Verb and its subject, forms of verb, Use of phrases and idioms, Use of infinitive Gerund and Participle, Errors & Use of Adjective and adverb, Punctuation and capitalization.

Reference Books:

1. R.K. Chaddha Communication Techniques and skills –Dhanpal Rai Publication, New Delhi.

2. Pravil S. R. Bhatia, Professional Communication Skills- S. Chand and Co.,New Delhi.

3. J.D.O'Connor, Better English pronounciation.

4. Wren and Martin, Highschool English Grammer and Composition – Chand and Co.

B.Sc. Information Technology (Semester – III) (NEP 2.0) (Level – 5.0)

Course: CC-I
Course Title: NSS
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Marks: 50 Credits: 02

Course Outcomes:

The course will enable students to;

1. This program aims to develop students' personalities through community service.
2. The Part I NSS syllabus, revised in 2019, gives students a foundational understanding of NSS principles and activities.
3. It encourages participation in social and community work.

UNIT I **(15 HOURS)**

Introduction and Basic Concepts of NSS: This unit covers the history, philosophy, aims, and objectives of NSS. It explores the organizational structure at national, state, and university levels, including the role of the Advisory Board and Programme Officer.

Organizational Structure and Roles of NSS: Focuses on the administrative structure from the national to the college level, including the roles of the Principal and Programme Officer.

NSS Programmes and Activities: This unit introduces the concept of regular NSS activities, including the Emblem, Flag, Motto, and Song. It also covers NSS Day celebrations and the structure of NSS camps (regular and special).

Community Mobilization: This unit examines methods for identifying and mobilizing communities. It also explores various social problems, including superstition and malnutrition, and introduces rain harvesting programs.

Volunteerism and Shramdan: This unit highlights the role of volunteers, the importance of "Shramdan" (voluntary labour), and how it contributes to volunteerism.

UNIT II **(15 HOURS)**

Changing Nature of NSS: Delves into the evolving nature of NSS, encompassing both regular and special camp activities. It also incorporates life skill development (emotional and psycho-social aspects).

Community Work Through NSS: Focuses on the meaning and nature of community work, procedures for conducting social surveys, and the aspects of social health (Women, Children, and differently-abled).

National Integration: Explores the meaning, nature, and obstacles to national integration, emphasizing the role of NSS in fostering unity.

References:

1. NATIONAL SERVICE SCHEME MANUAL (REVISED) 2006, Government of India, Ministry of Youth Affairs & Sports.

2. National Service Scheme: A Youth Volunteers Programme, by Amit Jain and Rathi, 2016e

B.Sc. Information Technology (Semester – IV) (NEP 2.0) (Level – 5.0)
Course: Subject III Major V
Course Title: Data Structure using C++ (Major)
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Teaching Scheme: Theory - 02 Lectures / Week Marks: 50 Credits: 02

Course Outcomes:

After completion of this course students will be able to;

1. Understand the basic concepts such as Abstract Data Types, Linear and Non Linear Data structures.
2. Ability to choose appropriate data structures to represent data items in real world problems.
3. Ability to analyze the time and space complexities of algorithms.
4. Ability to design programs using a variety of data structures such as array, stacks, queues, linked list

UNIT I: Introduction to Data structure (15 Hours)

Concepts of Data structure, Concept of Data, Data Object, Types of Data- Atomic Data, Non-atomic Data, Concept of Data Structure, Abstract data type (ADT). Array Definition, Array Operations, Applications of Array (Polynomial evaluation and addition of two polynomials), Multi-dimensional arrays. Algorithm Analysis, Space complexity, time complexity, Asymptotic notation (Big O, Omega Ω, Theta Θ) Searching algorithms-Linear search, binary search and their algorithms, Sorting algorithm –Bubble Sort, insertion sort, selection sort, quick sort and their algorithms.

UNIT II: Stack, Queue, Linked List and Tree (15 Hours)

Stack- Concept of Stack, Operations on Stack, Array implementation of Stack, Linked List Implementation of Stack, Applications of Stack-Recursion, Infix, Prefix, Postfix, conversion from Infix to Prefix and Infix to Postfix.Queue- Concepts of queue, Operations on Queue- Insert, Delete, peek, Array implementationof queue, Linked List Implementation of Queue, Types of Queue-Linear, Circular and Priority Applications of Queue .Linked List- Concept of Linked List, Memory representation of Linked List, Operations on Linked List (Insertion, Deletion, Display and Search) Types of Linked List -Singly, Doubly Linked List &Circular Linked List. Tree- Concept of Tree, Tree terminology (root, child, parent, sibling, descendant, ancestor, leaf/external node, branch node/internal node, degree, edge, path, level, depth, height of node, height of tree, forest) Binary Tree-definition, types (Full/Proper/Plane, Complete, Perfect Skewed, Balanced)

Books and References:-

1. Data structure through C++- Yashwant Kanitkar (BPB Publications)

2. Principles of Data structures using C++- Vinu V.Das (New Age International Publication)

3. Data Structures with C-Seymourlip schutz(Tata McGraw-Hill)

4. Data structures, Algorithms and Applications in C++, S. Sahni, University Press (India) Pvt. Ltd, 2ndedition, Universities Press Orient Longman Pvt. Ltd.

B.Sc. Information Technology (Semester – IV) (NEP 2.0) (Level – 5.0)
Course: Subject IV Major VI
Course Title: System Analysis Design & UML (Major)
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Teaching Scheme: Theory - 02 Lectures / Week Marks: 50 Credits: 02

Course Outcomes:

After completion of this course students will be able to;

1. Analyse and specify the requirements of a system.
2. Design system components and environments.
3. Provides a visual representation of an aspect of a system.

UNIT I (15 Hours)

Meaning, Definition and characteristics, Elements of System: Input, Output, Control, Feedback, Environment, Boundaries and Interface, Types of System System Development Life Cycle- Classical Model, Waterfall Model Feasibility Study: Operational , Technical, Economical Role and skill of system analyst, System planning and initial investigation

Fact Finding Technique- Interviews, Questionnaires, Record Interviews, Observation

Data Flow Diagram-Levels of DFDs, Entity Relationship Diagram. Architectural Design, Low LevelDesign: Modularization, Design Structure Charts, Pseudo Codes,Flow Charts, Coupling and Cohesion Measures, Design Strategies:Function Oriented Design, Object Oriented Design, Top-Down andBottom-Up Design.

UNIT II (15 Hours)

Testing and Types of testing. Architecture of UML. UML View Static View: Classifiers, Relationships Associations, Generalization, Realization, Dependencies, Constraint, Instances.

Use Case Diagrams: Overview, Actor, communication and relationships, Use Case examples

Class Diagrams: classes and object, association and links, multiplicity, Inheritance, example.

Activity Diagrams: Activities, actions, decisions, control nodes, fork and join node

Reference Books:

1. Systems Analysis and Design by Goyal A
2. Systems Analysis and Design by Dennis and Wixom
3. The Elements of UML(TM) 2.0 Style
4. The Unified Modeling Language User Guide by Grady Boochet All.

B.Sc. Information Technology (Semester – IV) (NEP 2.0) (Level – 5.0)
Course: Practical
Course Title: Practical Based on Subject II Major V & Major VI (Major)
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Teaching Scheme: Practical - 04 Lectures / Week Marks: 50 Credits: 02

Course Outcomes:

After completion of this course students will be able to;

1. Develop applications with searching.
2. Develop applications with sorting.
3. Develop applications with tree.

1. Write a C++ programs to implement recursive i)Linear search ii) Binary search
2. Write a C++ programs to implement
   a) Bubble sort ii) Selection sort iii) quick sort iv) insertion sort
3. Write a C++ programs to implement the following using an array.
   a) Stack ADT b) Queue ADT
4. Write a C++ programs to implement list ADT to perform following operations:

a) Insert an element into a list.
b) Delete an element from list
c) Search for a key element in list
d) Count number of nodes in list

5. Write a C++ programs to implement the following using a singly linked list.
   a) Stack ADT b) Queue ADT

6. Write a C++ programs for implementing the following sorting methods:
insertion sort, bubble sort, selection sort, quick sort

7. Write a C++ programs for implementation and operation using Circular Linked List on Circular Queue.

8. Write a C++ programs for implementation and operation of Binary Tree using array(use 0 to represent empty cell).

9. Write a C++ programs for implementation and operations (insert, display inorder, preoder and post order with recursive function) using Linked List on BST.

10. Draw DFD and ER diagram for library management system.

11. Draw class and sequence diagram for any system.

B.Sc. Information Technology (Entire)(Part-II)(Semester-IV) (NEP)

Course III Miner VII Course Title: Computer Networking

(Minor)

Total Contact Hours: 30 hrs. (30 lectures of 60min)

Credits: 02 Teaching Scheme: Theory–2Lectures/Week Total Marks: 40

Course Outcomes (COs): On completion of the course, the students will be able to:

1. Understand the concept of Networks & Network Models,
2. Understand different Networking Devices & Transmission media,
3. Understand the data linking, data flow control & error detection,
4. Understand Network Layer, Transport Layer, Application Layer,

Unit	Contents	Hours
1	**A) Computer Networks & Network Models:** Classification of Networks, Network Topologies, Network Models: TCP/IP Model, 7 Layered ISO/OSI Model, Applications of each Layer of ISO/OSI Model, **B) Physical Layer:** Transmission Media: Guided & Unguided Media,Co-axial Cable, Optical fiber, Ground-wave Propogation, Sky-wave Propogation, Microwave linking, Satellite linking, Networking devices: Hub, Switch, Router, Bridge, Gateway, Data Modems, Multiplexing techniques, **C) Data-Link Layer:** Data-flow control- Framing, Data Error detection & Data Error correction, Stop and Wait Protocol, Sliding Window Protocols,	**15**

2	**A) Network Layer:** Logical Addressing, IPv4 addressing: address space, classes of addressing, IPv6 addressing, Comparison between IPv4 & IPv6 addressing, Internet Protocol(IP): IP Datagram format, Fragmentation, ICMP Protocol &Messages, **B) Transport Layer:** Services-Connection-less & Connection-Oriented Service, UDP Protocol: User Datagram, UDP services & applications, TCP Protocol: TCP services, TCP features, TCP segment structure, TCP connection, SCTP Protocol: SCTP services, SCTP features, SCTP packet format, **C) Application Layer:** World-Wide-Web(www), Domain Name System(DNS), HTTP Protocols, FTP Protocols, Email Protocols: SMTP protocol, POP protocol, IMAP protocol, SNMP protocol, DHCP Protocol, Remote Login Protocols: TELNET Protocol, SSH Protocol,	**15**

Reference Books:

1. Computer Networking by Andrew Tannenbaum,
2. Data & Computer communication by William Stallings,
3. Advanced Computer Networking by Nirali Publication,
4. Computer Networking & Data Communication by Nirali Publication

B.Sc. Information Technology (Entire)(Part-II)(Semester-IV) (NEP)

Course III, Miner _VIII Course Title: Micro-Controller & Interfacing, (Minor)

Total Contact Hours: 30 hrs.(30 lectures of 60 min.)

Credits: 02 Teaching Scheme: Theory–2 Lectures/Week Total Marks: 40

Course Outcomes (COs): On completion of the course, the students will be able to

1. Understand the difference between Microprocessor & Micro-controller,
2. Learn & Understand the Instruction set of Micro-controller,
3. To study different features of Micro-controller,
4. To study interfacing of different peripheral devices with Micro-controller

Units	Contents	Hours
1.	**A) Introduction to Micro-controller-8051:** Comparison between Micro-controller&Microprocessor,4-bit,8-bit,16-bit&32-bit Micro-controllers & their applications, Study of 8051 Micro-controller & its family, Comparative study of 89c51, 8031, 8032,8052, 8751, 89c51RD2, 89c51VRD2, Architecture of 8051: Internal Block diagram of 8051, Reset & Clock signal, Registers, Flags, Internal memory, SFR registers, I/O ports, **B) 8051 Instruction Set:** Instruction Set, Addressing Modes, Types of Instructions: Arithmetic & Logical, Data transfer, Jump, loop, CALL, Bit Manipulation, Serial Communication instructions, machine control instructions, Assembly language programming, Embedded C programming,	15
2.	**A) Facilitiesin8051:** **Timers & Counters:** Timer Modes ,Programming of Timers & Counters, Assembly language programming , Embedded C programming, Time-delay generation, **Serial Port:** Programming of Serial Port,RS-232standards,ICMAX-232,Baud Rate, Programming for transmitting character through serial port in assembly & Embedded C, **B) Interfacing of Peripheral devices with 8051:** Interfacing of LED, Relay, Opto-coupler, Thumb-wheel switch,7-	15

	segmentdisplay, Interfacing of Stepper motor, DC motor(PWM), LCD (16x2) with 8051, with Assembly language & Embedded C programming,	

Reference Books:

1. 8051Micro-controllers&InterfacingbyMohammadMazidi,
2. 8051Micro-controller by K. J. Ayala,
3. 8051 Micro-controller by Ajay Deshmukh,
4. Micro-controller & Interfacing by A. P. Godse, Technical publication,
5. Micro-controller Architecture & Programming, by Nirali Publication,

B.Sc. Information Technology (Entire)

(Part-II)(Semester-IV)(NEP)

Practical-I (Minor)

(Electronics Practical based on Minor VII & VIII)

1. Interfacing of LED, Relay & Opto-coupler with Microcontroller-8051,
2. Interfacing of a Thumb-wheels witch or 7-segmentdisplaywith 8051,
3. Time delay generation using Timers(inMode1orMode2)of 8051,
4. Interfacing of a Stepper motor with 8051,
5. Interfacing of DC motor (PWM) with 8051,
6. Arithmetic&Logicaloperationsbyusing8051,
7. InterfacingofDACwith8051togenerateSquarewave&Triangularwave,
8. Interfacing of LCD display & Keyboard with micro-controller 8051,
9. Interfacing of ADC to sample a signal & convert into digital with 8051,
10. Programming & transmission of Serial data through serial port of 8051,
11. Introduction to Networking devices, cables & connectors, Crimping tool & LAN tester,
12. Preparation of Patch cord & Cross connection cable to connect devices in a LAN,
13. Configuration of LAN: setting of IP addresses manually & DHCP addressing,
14. Prepare & configure a LAN of 3 computers using HUB/Switch, for sharing of Resources,
15. Study of different Networking commands on command line interface in a LAN,
16. Study of different Networking software: Cisco Packet Tracer, Network Simulator (NS),
17. Configure Internet connectivity of your computer in a LAN with LAN Network drivers,
18. Study of sharing of resources by FTP protocol to transfer a file from ones system to another
19. Interconnect two computers by using RS-232 cable & transfer data between computers,
20. Install &configure Router/Repeater/Bridge of your LAN network,

B.Sc. Information Technology (Semester – IV) (NEP 2.0) (Level – 5.0)
Course: Minor VII
Course Title: Computational Geometry (Minor)
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Teaching Scheme: Theory - 02 Lectures / Week Marks: 50 Credits: 02

Course Learning Outcomes:

This course will enable the students to:

1. Apply transformations on points, straight lines, and unit planes, including midpoint and solid-body transformations.
2. Implement fundamental transformations such as scaling, shearing, rotation, reflection, and their combinations to solve geometric problems.
3. Utilize homogeneous coordinates for transformations like translation, arbitrary point rotation, and reflection through arbitrary lines.
4. Analyze the principles of three-dimensional transformations, including scaling, shearing, rotation, reflection, and translation.
5. Apply multiple transformations, including rotation about axes parallel to coordinate axes and arbitrary axes in space, and reflection through various planes.

Unit I : Introduction to Two dimensional transformations (15 Hrs)

1.1 Introduction
1.2 Representation of Point
1.3 Transformation and Matrices
1.4 Transformation of points and straight lines
1.5 Midpoint transformation
1.6 Transformation of parallel lines and intersecting lines
1.7 Transformation: Scaling, Shearing, Rotation, Reflection
1.8 Combined Transformation
1.9 Transformation of a unit plane
1.10 Solid body Transformation
1.11 Transformation and homogeneous coordinates-Translation.
1.12 Rotation about an arbitrary point.
1.13 Reflection through an arbitrary line.
1.14 Overall Scaling.
1.15 Point at infinity

Unit II: Three dimensional transformations and Plane Curves (15 Hrs.)

2.1 Introduction.

2.2 Three dimensional–Scaling, Shearing, Rotation, Reflection, Translation.

2.3 Multiple transformations.

2.4 Rotation about an axis parallel to coordinate axes,an arbitrary axis in space.

2.5 Reflectionthrough–coordinateplanes,planesparalleltocoordinateplanes, arbitrary planes.

2.6 Introduction to Plane Curves

2.7 Curve representation of Parametric curves.

2.8 Parametric representation of a circle and generation of circle.

2.9 Parametric representation of an ellipse and generation of ellipse.

2.10 Parametric representation of a parabola and generation of parabolic segment

Recommended Book:

1. Mathematical Elements for Computer Graphics, David F. Rogers and J. Alan Adams, 2nd Edition, McGraw-Hill, 1989.

Reference Books:

1. Schaum's Outline of Computer Graphics, Roy A. Plastock and Zhigang Xiang, 2nd Edition, McGraw-Hill, 2000.
2. Computer Graphics Handbook: Geometry and Mathematics, M.E. Mortenson, Industrial Press Inc., 1990.

B.Sc. Information Technology (Semester – IV) (NEP 2.0) (Level – 5.0)
Course: Minor VIII
Course Title: Optimization Techniques (Minor)
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Teaching Scheme: Theory - 02 Lectures / Week Marks: 50 Credits: 02

Course Learning Outcomes:

This course will enable the students to:

1. Explain the fundamental concepts of transportation and assignment problems, including their mathematical formulations.
2. Apply methods such as North-West Corner, Matrix Minima, Vogel's Approximation, and MODI to find optimal transportation solutions.
3. Analyze assignment problems using the Hungarian method, including cases with maximization, restrictions, and unbalanced assignments.
4. Evaluate optimal solutions for transportation and assignment problems, including the Traveling Salesman Problem, using appropriate techniques.

Unit I : Transportation problem (15 Hrs)

1.1 Basics of Transportation problem
1.2 Initial Solution by
  1.2.1 North–West corner method and examples
  1.2.2 Matrix minima method and examples
1.3 Vogel's approximation method and examples
1.4 MODI method and examples
1.5 Unbalanced transportation problem and examples
1.6 Maximization transportation problem

Unit II: Assignment problem (15 Hrs)

2.1 Introduction to Assignment problem
2.2 Hungarian method and examples
2.3 Maximization in Assignment problems and examples
2.4 Unbalanced Assignment problem and examples
2.5 Assignment problem with restriction
2.6 Travelling Salesman problem

Recommended Book:

1. Operations Research, S. D. Sharma, 15th Edition, KedarNath Ram Nath& Co., 2010.

Reference Books:

2. Principles of Operations Research, H. M. Wagner, 2nd Edition, Prentice Hall, 1975.
3. Operations Research, Gupta and Hira, S. Chand & Company, 2008.
4. Operations Research: Theory and Applications, J. K. Sharma, 2nd Edition, Macmillan Publishers, 2003.

B.Sc. Information Technology (Semester – IV) (NEP 2.0) (Level – 5.0)
Course: Minor Practical IV
Course Title: Mathematics Laboratory course–IV (Minor)
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Teaching Scheme: Practical - 04 Lectures / Week Marks: 50 Credits: 02

Practical Number	Title of the Practical
1	Plane Linear transformation – I Scaling, Shearing, Reflection Combined transformation matrix
2	Plane Linear transformation – II - Rotation about origin, Rotation about arbitrary point, Reflection through arbitrary line
3	Space linear transformation – I Scaling, Shearing and Rotation about Co –ordinate axis,
4	Space linear transformation – II - Reflection through Co – ordinate planes, Translation Multiple transformations
5	Space linear transformation – III – Rotation about a line parallel to Co –ordinate axis, Rotation through planes which are parallel to Co – ordinate planes
6	Plane Curves – I Generation of points on circle and ellipse (Examples only)
7	Plane Curves _ II Generation of points on parabolic segment(Examples only)
8	Initial solution of transportation problem - I North –West Corner method,
9	Initial solution of transportation problem - II Matrix minima method
10	Initial solution of transportation problem - III Vogel's approximation method
11	Modi Method
12	Unbalanced transportation problem
13	Assignment Problem- Maximization type
14	Assignment Problem-Minimization type
15	Unbalanced Assignment problem

B.Sc. Information Technology (Semester – III) (NEP 2.0) (Level – 5.0)
Course: OE-II

- **To be selected from the OE Basket**

B.Sc. Information Technology (Semester – III) (NEP 2.0) (Level – 5.0)
Course: SEC-II
Course Title: Advanced Python Programming (Major)
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Teaching Scheme: Practical - 04 Practical / Week
Marks: 50 Credits: 02

Course Outcomes:

After completion of this course students will be able to;

1. The Object-oriented programming skills in Python.
2. The skill of to design graphical-user interfaces (GUI) in Python.
3. An ability to write database applications in Python.

List of Programmes

1. Python program to interchange first and last elements in a list.
2. Python Program to Swap Two Elements in a List.
3. Different ways to clear a list in Python.
4. How to Find the Length of a List in Python.
5. Python program to find String in a List.
6. Demonstrate Python Module.
7. Demonstrate Python function.
8. A pangram is a sentence that contains all the letters of the English alphabet at least once, for example: The quick brown fox jumps over the lazy dog. Your task here is to write a function to check a sentence to see if it is a pangram or not. 10. Take a list, say for example this one: a = [1, 1, 2, 3, 5, 8, 13, 21, 34, 55, 89] and write a program that prints out all the elements of the list that are less than any given number.
9. Write a program that takes two lists and returns true if they have at least one commonmember.
10. Write a Python program to print a specified list after removing the 0th, 2nd, 4th and 5th elements.
11. Design a GUI based application to display button, label& text control.
12. Design a GUI based calculator to perform arithmetic operations like addition, subtraction, multiplication and division. (Hint: Expression Calculator using tk)
13. Design a GUI based application to convert temperature from Celsius to Fahrenheit.
14. Write a python program to perform various database operations (create, insert, delete, update)
15. Write a python program to demonstrate operator overloading.
16. Write a python program to create abstract classes and abstract methods.
17. Read two numbers n1 and n2. Write a function to compute n1/n2 and use try/except to catch the exceptions.

B.Sc. Information Technology (Semester – III) (NEP 2.0) (Level – 5.0)
Course: AEC-II
Course Title: Soft Skills (Major)
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Marks: 50 Credits: 02

Course Outcomes:

The course will enable students to;

1. To empower the students towards general and technical writing, oral communications
2. To empower listening skills: letter writing, technical report writing, and business communication.

UNIT I **(15 Hours)**

Expression: Practical communication skill development, business presentation with multimedia, speaking skill, prepared speech, extempore speech.

UNIT II **(15 Hours)**

Writing: Technical/business letter, Resume Preparation, organization of writing material, poster presentation, writing technical document, preparing software user manual, preparing project documentation.

Reference Books:

1. Business Correspondence & Report Writing, Sharma, TMH
2. Business Communication Strategies, Monipally, TMH
3. English for Technical communication, Laxminarayanan,Scitech
4. Business Communication, Kaul,PHI
5. Communication Skill for Effective Mgmt., Ghanekar,EPH

B.Sc. Information Technology (Semester – III) (NEP 2.0) (Level – 5.0)
Course: VEC-II
Course Title: Environment Studies
Total Contact Hours: 30 Hrs. (30 Lectures of 60 minutes)
Marks: 50 Credits: 02

- To be taken from Environmental Science BoS

B.Sc. Information Technology (Semester – III) (NEP 2.0) (Level – 5.0) Title of course: CEP-I: Field work

- **Field work as per NEP 2.0 (CEP, CC), University circular enclosed**